



# ***Status and Modernization of the US Global Positioning System***

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Director**

**Global Positioning Systems Directorate**



# Global Positioning System (GPS)

## Mission:

Acquire, deliver and sustain reliable GPS capabilities to America's warfighters, our allies, and civil users.



Col Bernie Gruber



***Deliver and Sustain Global Navigation and Timing Service***

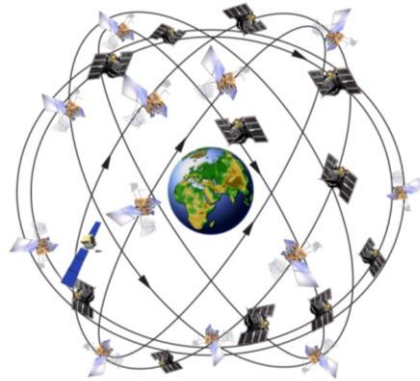


# GPS Enterprise View



## Civil Cooperation

- 1+ Billion civil & commercial users
- Search and Rescue
- Civil Signals
  - ☐ L2C (2<sup>nd</sup> Civil Signal)
  - ☐ L5 (Safety of Life)
  - ☐ L1C (International)



34 Satellites/ 31 Set Healthy

Baseline Constellation: 24 Satellites

Satellite	Quantity	Avg Life	Oldest
GPS IIA	10	18.0	21.3
GPS IIR	12	10.2	14.6
GPS IIR-M	7	4.6	6.4
GPS IIF	2	1.2	1.8
Constellation	31	10.9	21.3

AS OF 1 MAR 12

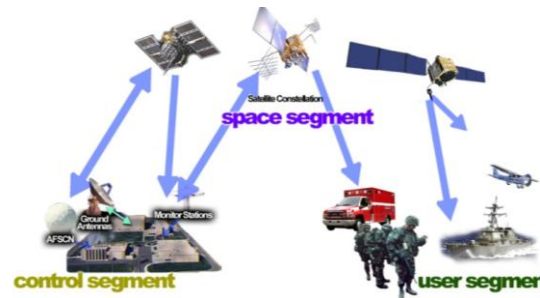


## Department of Transportation

- Federal Aviation Administration

## Department of Homeland Security

- U.S. Coast Guard



## Department of Defense

- Services (Army, Navy, AF, USMC)
- Agencies (NGA, DISA, etc.)
- US Naval Observatory
- PNT EXCOMS, NPEF, etc...
- GPS Partnership Council

## Maintenance/Security

- All Level I and Level II
  - ☐ Worldwide Infrastructure
- Develop & Publish ICDs Semi-Annually
  - ☐ ICWG: Worldwide Involvement
- Update GPS.gov Webpage

## International Cooperation

- Deconflict PRN usage for 8 global PNT systems
  - ☐ 63 for US and 147 for other GNSS
- 25+ Years of Cooperation with 50+ Nations
- GNSS
  - ☐ China – COMPASS (BeiDou)
  - ☐ Europe – Galileo/EGNOS
  - ☐ India – IRNSS/GAGAN
  - ☐ Japan – QZSS/MSAS
  - ☐ Russia – GLONASS/SDCM

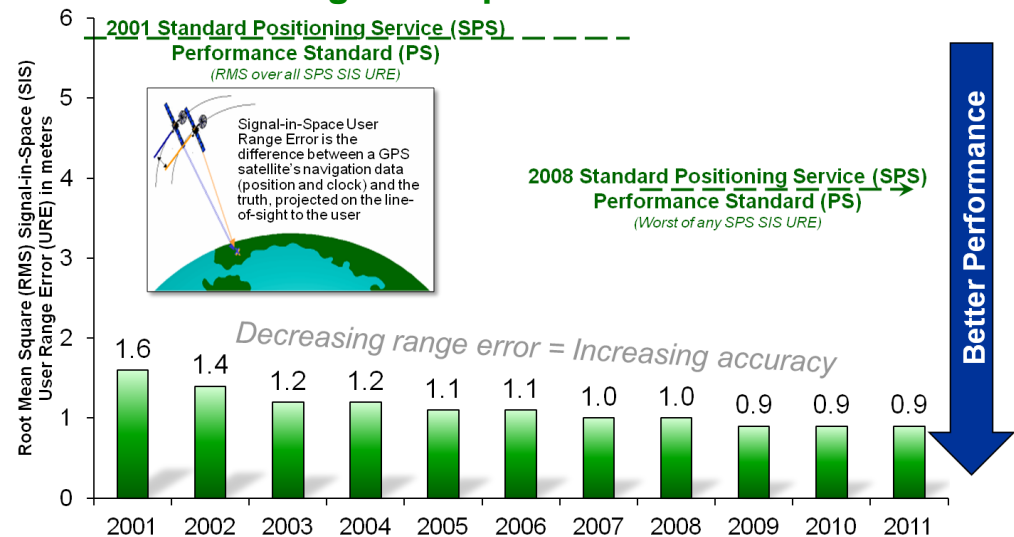


# GPS Constellation

- **Very robust constellation**
  - 31 space vehicles (SVs) currently in operation
    - 10 GPS IIA
    - 12 GPS IIR
    - 7 GPS IIR-M
    - 2 GPS IIF
  - 3 additional satellites in residual status
- **Global GPS civil service performance commitment met continuously since Dec 1993**



## Civil Signal in Space Performance







# GPS IIF Status

- **Launched GPS IIF-2 on 16 Jul 11**
  - Satellite Vehicle Number 63, PRN 1
  - Set healthy 14 Oct 11
  - Second operational L5 signal
  - Increases the enhanced GPS clock performance coverage
- **2 total IIFs on orbit**
  - Best accuracies so far; 0.38 m RMS across family
- **10 more GPS IIFs in the pipeline**
  - SVs 3-4 in storage
  - SVs 5-8 are in assembly, integration and test
- **Next GPS IIF Launch scheduled for Sep 2012**





# GPS III Status

- **Newest block of GPS satellites**
  - First GPS satellite to broadcast common L1C signal
  - Multiple civil and military signals; L1 C/A, L1 P(Y), L1M, L1C, L2C, L2 P(Y), L2M, L5
  - Three Rubidium clocks
- **Completed Critical Design Review for SVs 1-8**
- **Program granted Milestone C approval for SVs 1-8**
- **Prototype and engineering unit build/test underway**
  - Completed 57 of 59 Manufacturing Readiness Reviews
  - Completed 47 of 59 Test Readiness Reviews
- **GPS Nonflight Satellite Testbed (GNST) powered up 10 Jan 12**
  - Integration underway; full navigation panel turned on 7 Feb 12
- **Completed System Design Review for SVs 9+**





# Ground Segment Status



Monitor Station



Master Control Stations at  
Schriever AFB, Colorado



Ground Antenna

- **Current system Operational Control Segment (OCS)**
  - Currently flying GPS IIA/IIR/IIR-M/IIF constellation
  - Added the capability for anomaly resolution and disposal ops for IIF (LADO)
- **Next Generation Operational Control System (OCX) Phase B continues on track**
  - Preliminary Design Review completed Aug 2011
  - Completed first Hardware Critical Design Review 1 Mar 12
  - Delivered 2 of 7 software iterations
  - OCX Block I deployment planned for 2015



# Recent International Participation

- **World Radio Conference (WRC-12) Jan-Feb 2012**
  - GPS actively participated in coordinating international spectrum usage
- **International Astronautical Federation (IAF) Oct 2011**
  - GPS honored with the IAF 60<sup>th</sup> Anniversary Award
- **Resolution 609 Consultation Meeting Sept 2011**
  - Consulted with other GNSS providers to ensure protection of aeronautical receivers in L5 band
- **International Committee on GNSS (ICG-6) Sept 2011**
  - Continued collaboration between GNSS providers to ensure compatibility and interoperability



## President Obama's National Space Policy of 2010 states:

“Engage with foreign GNSS providers to encourage compatibility and interoperability, promote transparency in civil service provision...”







# Summary

- GPS has continuously met its commitments to all users
- Modernization of all GPS Segments is on track
- Striving to continually improve navigation and timing services while maintaining backward compatibility with legacy equipment
- GPS is committed to open and transparent cooperation with the international GNSS community

The screenshot displays the GPS.gov website, which is the official U.S. Government information source for the Global Positioning System (GPS) and related topics. The site features a navigation bar with links to HOME, WHAT'S NEW, SYSTEMS, APPLICATIONS, POLICY & FUNDING, MULTIMEDIA, and SUPPORT. A search bar is located in the top right corner. The main content area is titled "Bienvenidos Welcome أهلاً وسهلاً 歡迎光臨 Bienvenue" and includes a graphic of people holding hands around a globe. To the right, a text box states: "To improve global understanding about GPS, we are pleased to offer key portions of this website in multiple languages. Please note that some pages may link back to English-language content." Below this, the "Multilingual Content" section lists links for Español, Français, and 中文. The 中文 section includes links for 首页, 全球定位系统, GPS的增强系统, and GPS的应用. The Français section includes links for Accueil, Le Système de Positionnement Mondial, Compléments GPS, and Applications du GPS. The 中文 section also includes links for الصفحة الرئيسية, نظام التموضع العالمي, إضافات إلى نظام التموضع العالمي, and تطبيقات النظام. To the right of the multilingual content, there is a section titled "GPS Cooperation with Other Nations" listing Australia, China, Europe, India, Japan, Russia, International Committee on GNSS, and Other International Organizations. Below this, there is a section titled "GPS Outreach Handouts" showing various handouts. At the bottom, the "International GPS User Support" section features the U.S. Coast Guard Navigation Center (NAVCEN) logo and text stating: "The U.S. Coast Guard Navigation Center (NAVCEN) is the designated point of contact within the U.S. government for GPS user support to civilians outside the United States, including international civil aviation users. Through their website and email list, NAVCEN disseminates information to".

**Maintaining And Improving GPS Services For All Users Is Job #1**



# Questions?